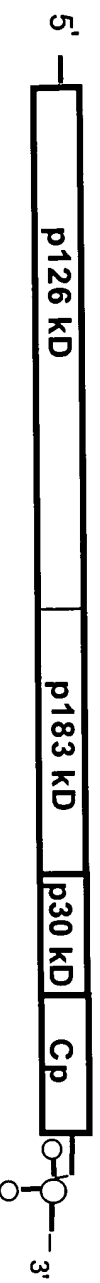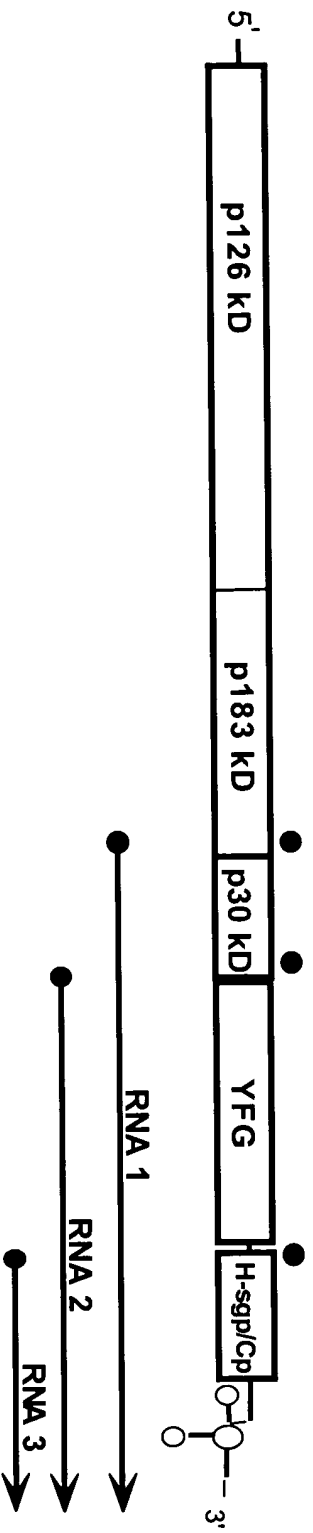# FIG. 1

Tobamovirus Expression Vectors

TMV
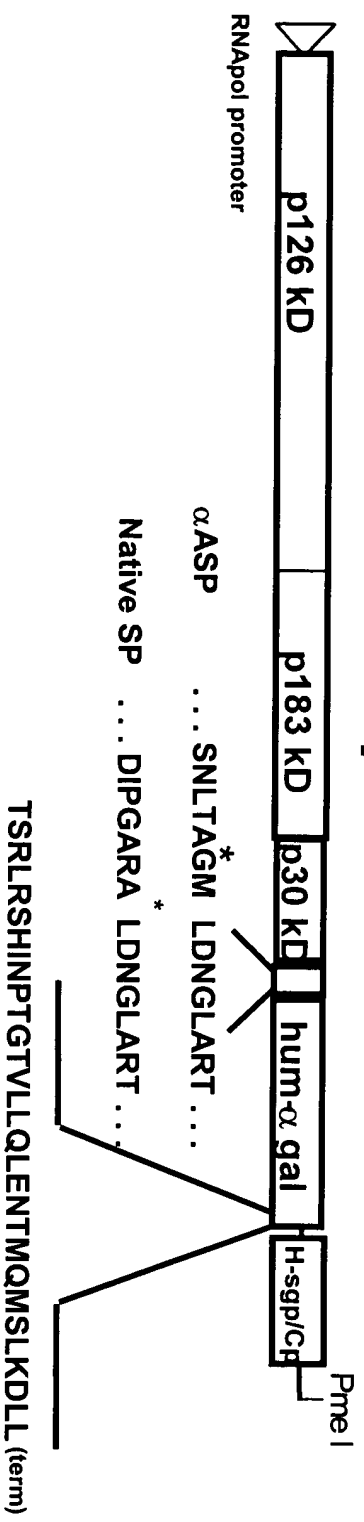

TMV-Expression Vector

FIG. 2

Tobamovirus Vector for rGal-A Expression

RNApol promoter

p126 kD

p183 kD

p30 kD

hum-α gal

H-sgp/Cp

Pme I

αASP   ... SNLTAGM LDNGLART ...
              *

Native SP ... DIPGARA LDNGLART ...
                          *

TSRLRSHINPTGTVLLQLENTMQMSLKDLL (term)

FIG. 3

Accumulation and Activity of WT rGal-A

A.

Western Analysis
total plant soluble extract
anti human GAL-A sera

B.
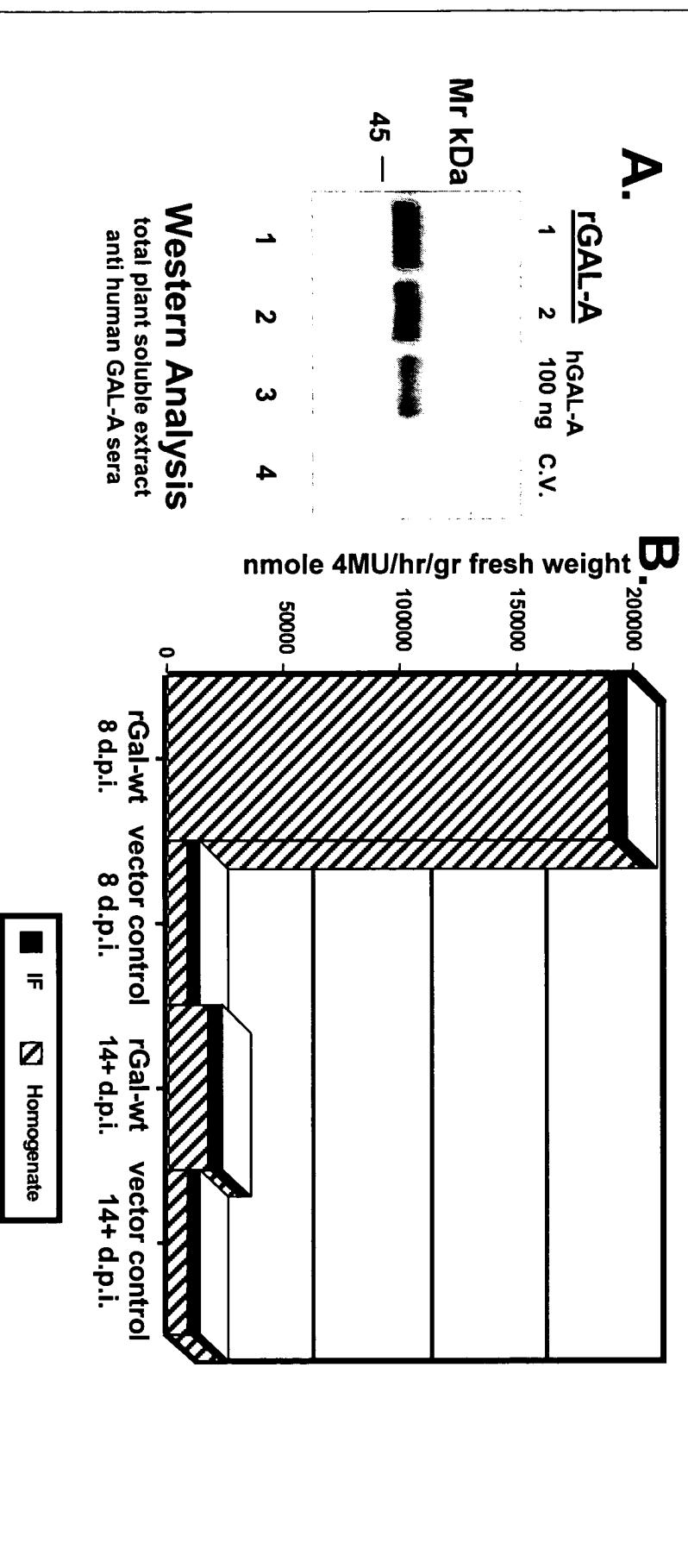
FIG. 4

Accumulation and Activity of WT and ER-Targeted rGal-A

A.

Mr kDa

Uninf. rGAL-A rGAL-A-R

45 —

1   2   3

Western Analysis
total plant soluble extract
anti human GAL-A sera

B.

nmole 4MU/hr/gr fresh weight

0   50000   100000   150000   200000

rGal-wt 8 d.p.i.
rGal-wtR 8 d.p.i.
rGal-wt 14+ d.p.i.
rGal-wtR 14+ d.p.i.

■ IF   ▨ Homogenate
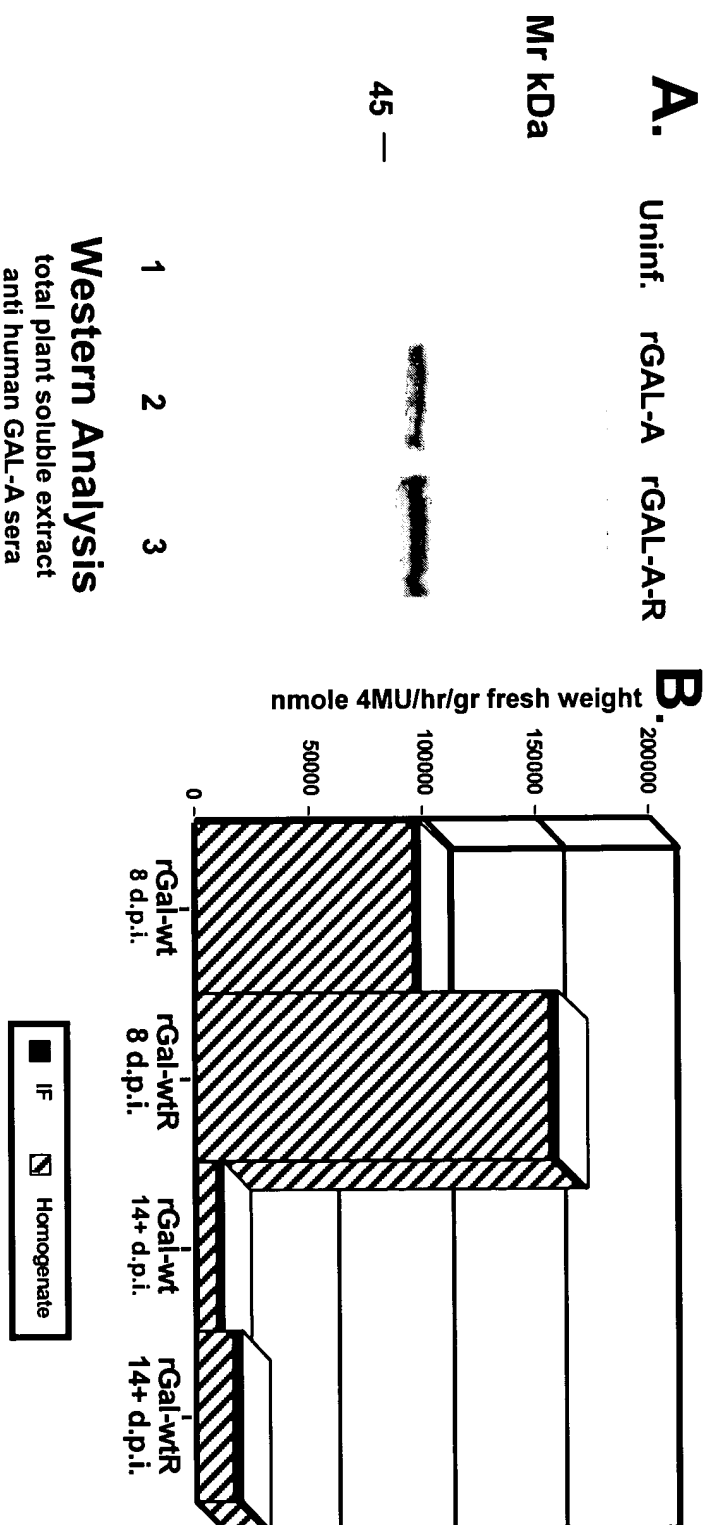
FIG. 5

Carboxy-Modifications to rGal-A

	-30	- 20	-10	
		*		
WT	TSRLRSHINPTGTVLLQLENTMQMSLKDLL
WTR	TSRLRSHINPTGTVLLQLENTMQMSLKDLLSEKDEL
Δ4	TSRLRSHINPTGTVLLQLENTMQMSL
Δ4R	TSRLRSHINPTGTVLLQLENTMQMSLSEKDEL
Δ8	TSRLRSHINPTGTVLLQLENTM
Δ8R	TSRLRSHINPTGTVLLQLENTMSEKDEL
Δ12	TSRLRSHINPTGTVLLQL
Δ12R	TSRLRSHINPTGTVLLQLSEKDEL
Δ25	TSRLR
Δ25R	TSRLRSEKDEL

Control virus (GFP, AMP, IFNg)

*potential CTPP cleavage (Gene 58:177,1987).

FIG. 6

Western Blot Analysis of Carboxy-modified rGal-A

45 kDa —

hGal (200ng)
vector control
rGal wt
rGal-R
rGal-Δ 4
rGal-Δ 4R
rGal-Δ 8
rGal-Δ 8R
rGal-Δ 12
rGal-Δ 12R
rGal-Δ 25
rGal-Δ 25R

45 kDa —

total
Homogenate

IF-1 fraction
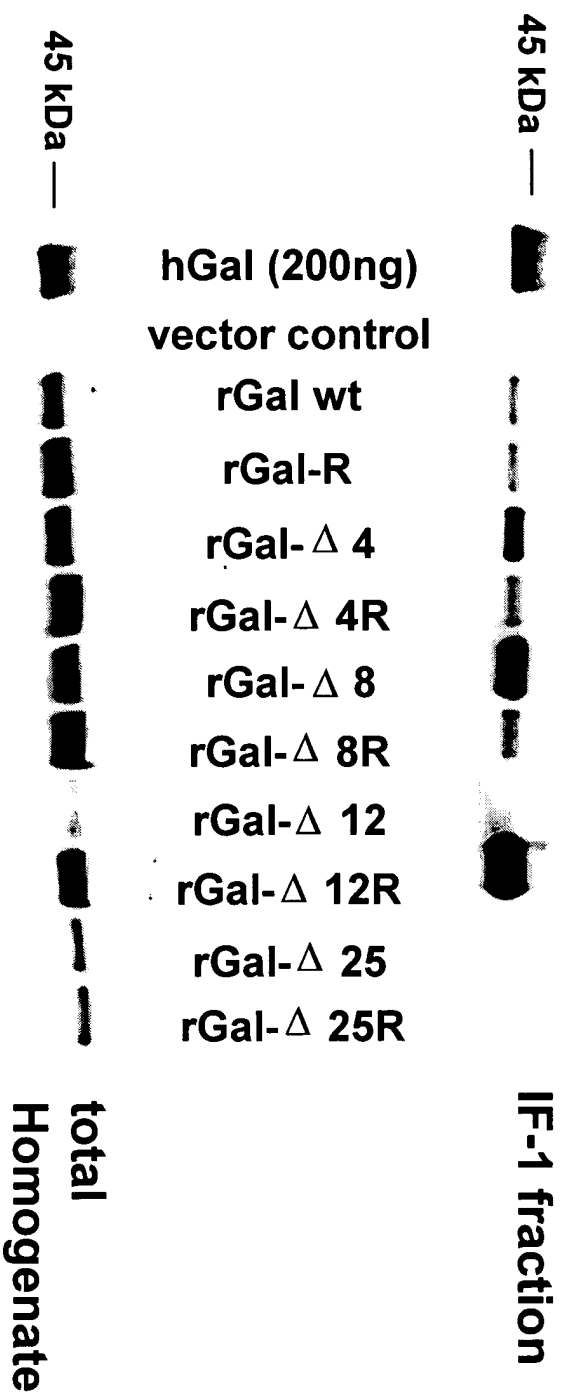
FIG. 7
Enzymatic Activity of Carboxy-Modified rGal-A

nmole 4MU/hr/gr fresh weight

Legend: ☒ IF   ☐ Homogenate

Axis: 0   500,000   1,000,000   1,500,000

Bars (top to bottom): C.V., ²25R, ²25, ²12R, ²12, ²8R, ²8, ²4R, ²4, WTR, WT

		*	-30	-20	-10
WT	*	TSRLRSHINPTGTVLLQLENTMQMSLKDLL			
WTR		TSRLRSHINPTGTVLLQLENTMQMSLKDLLSEKDEL			
²4		TSRLRSHINPTGTVLLQLENTMQMSL			
²4R		TSRLRSHINPTGTVLLQLENTMQMSLSEKDEL			
²8		TSRLRSHINPTGTVLLQLENTM			
²8R		TSRLRSHINPTGTVLLQLENTMSEKDEL			
²12		TSRLRSHINPTGTVLLQL			
²12R		TSRLRSHINPTGTVLLQLSEKDEL			
²25		TSRLR			
²25R		TSRLRSEKDEL			
Control virus (GFP, AMP, IFN9)					

* potential CTPP cleavage (Gene 58:177,1987).

FIG. 8

Coomassie Stain - IF

Mr kDa									
200 —									
116 —									
97 —									
66 —									
45 —									
31 —									
21.5 —									
14.4 —									
6.5 —									

M	C.V.	C.V.	Δ12R	Δ4	Δ4R	Δ8	Δ8	Δ8R	hGAL-A
1	2	3	4	5	6	7	8	9	10

FIG. 9

Mr kDa

200 —
116 —
97 —
66 —
45 —
31 —
21.5 —
14.4 —
6.5 —

1   2   3   4   5   6   7   8

M   hGAL-A   Δ12R   Δ12R   Δ12   Uninf.   Δ25R   Δ25

Coomassie Stain - IF

FIG. 10

Schematic of rGal-A Secretion
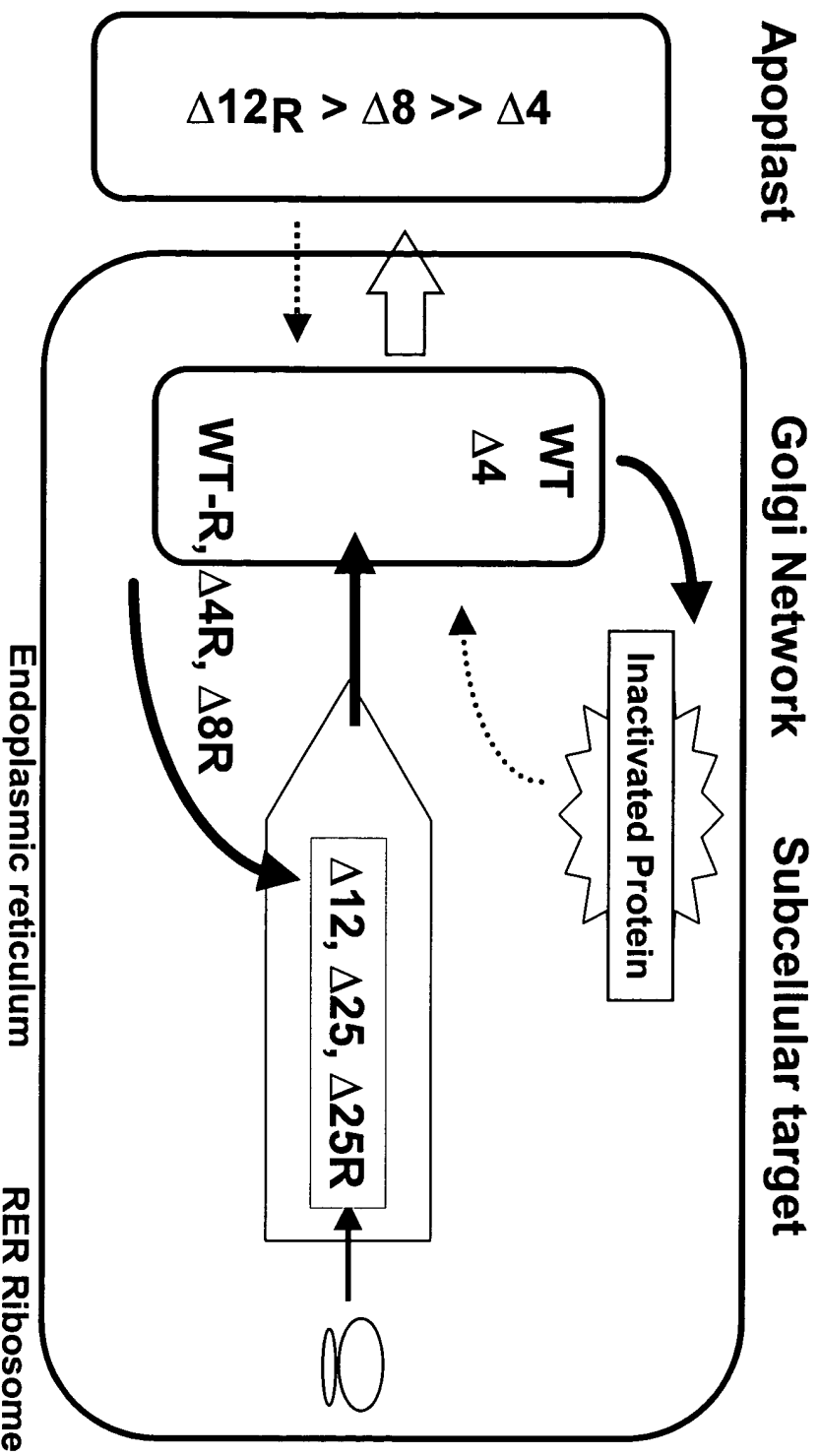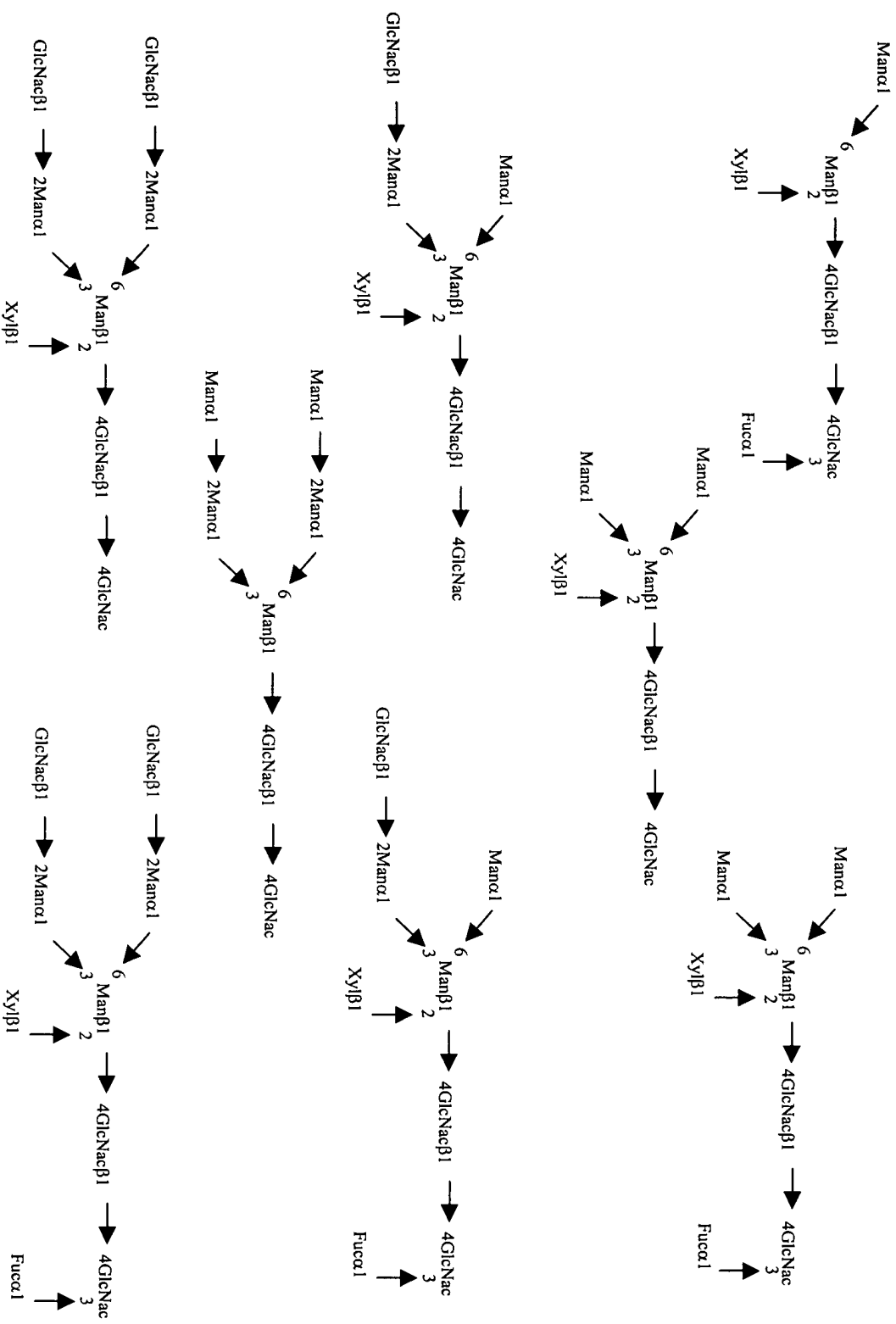
Apoplast · Golgi Network · Subcellular target

$\Delta 12_R > \Delta 8 >> \Delta 4$

WT
$\Delta 4$

WT-R, $\Delta 4R$, $\Delta 8R$

$\Delta 12$, $\Delta 25$, $\Delta 25R$

Inactivated Protein

Endoplasmic reticulum · RER Ribosome

FIG. 11

Manα1 →6 Manβ1 →4GlcNacβ1 →4GlcNac
                2   3
Xylβ1 →   Fucα1 →

GlcNacβ1 →2Manα1
                        ↘3
Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                        2
Xylβ1 →

Manα1 ↘3
Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                        2
Xylβ1 →

Manα1 →2Manα1 ↘3
Manα1 →2Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                                2

GlcNacβ1 →2Manα1 ↘3
GlcNacβ1 →2Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                                3
Xylβ1 →

Manα1 ↘3
Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                        2   3
Xylβ1 →   Fucα1 →

GlcNacβ1 →2Manα1 ↘3
Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                        2   3
Xylβ1 →   Fucα1 →

Manα1 →2Manα1 ↘3
Manα1 →2Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                                2

GlcNacβ1 →2Manα1 ↘3
GlcNacβ1 →2Manα1 ↗6 Manβ1 →4GlcNacβ1 →4GlcNac
                                3   3
Xylβ1 →   Fucα1 →

FIG. 12-1

GTATTTTTACAACAATTACCAACAACAACAAACAACAAACAACATTACAATTACTATTTACAATTACAATGGCATACACA
CAGACAGCTACCACATCAGCTTTGCTGGACACTGTCCGAGGAAACAACTCCTTGGTCAATGATCTAGCAAAGCGTCGTCT
TTACGACACAGCGGTTGAAGAGTTTAACGCTCGTGACCGCAGGCCCAAGGTGAACTTTTCAAAAGTAATAAGCGAGGAGC
AGACGCTTATTGCTACCCGGGCGTATCCAGAATTCCAAATTACATTTTATAACACGCAAAATGCCGTGCATTCGCTTGCA
GGTGGATTGCGATCTTTAGAACTGGAATATCTGATGATGCAAATTCCCTACGGATCATTGACTTATGACATAGGCGGGAA
TTTTGCATCGCATCTGTTCAAGGGACGAGCATATGTACACTGCTGTATGCCCAACCTGGACGTTCGAGACATCATGCGGC
ACGAAGGCCAGAAAGACAGTATTGAACTATACCTTTCTAGGCTAGAGAGAGGGGGGAAAACAGTCCCCAACTTCCAAAAG
GAAGCATTTGACAGATACGCAGAAATTCCTGAAGACGCTGTCTGTCACAATACTTTCCAGACAATGCGACATCAGCCGAT
GCAGCAATCAGGCAGAGTGTATGCCATTGCGCTACACAGCATATATGACATACCAGCCGATGAGTTCGGGGCGGCACTCT
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GACGAAATCAACGCGTGTTTTTCGCGCGATGGAGACAAGTTGACCTTTTCTTTTGCATCAGAGAGTACTCTTAATTATTG
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TCGACATTTCTTTGGAGACTAGTAAGAGGACGCGCAAGGAAGTCTTAGTGTCCAAGGATTTCGTGTTTACAGTGCTTAAC
CACATTCGAACATACCAGGCGAAAGCTCTTACATACGCAAATGTTTTGTCCTTTGTCGAATCGATTCGATCGAGGGTAAT
CATTAACGGTGTGACAGCGAGGTCCGAATGGGATGTGGACAAATCTTTGTTACAATCCTTGTCCATGACGTTTTACCTGC
ATACTAAGCTTGCCGTTCAAAGGATGACTTACTGATTAGCAAGTTTAGTCTCGGTTCGAAAACGGTGTGCCAGCATGTG
TGGGATGAGATTTCGCTGGCGTTTGGGAACGCATTTCCCTCCGTGAAAGAGAGGCTCTTGAACAGGAAACTTATCAGAGT
GGCAGGCGACGCATTAGAGATCAGGGTGCCTGATCTATATGTGACCTTCCACGACAGATTAGTGACTGAGTACAAGGCCT
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TTCAAAGGTTCCAATCTTTTTGTTGCAGCGCCAAAGACTGGTGATATTTCTGATATGCAGTTTTACTATGATAAGTGTCT
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GCGCAGATTGAGGATTTCTTCGGAGATCTCGACAGTCATGTGCCGATGGATGTCTTGGAGCTGGATATATCAAAATACGA

FIG. 12-2

CAAATCTCAGAATGAATTCCACTGTGCAGTAGAATACGAGATCTGGCGAAGATTGGGTTTTGAAGACTTCTTGGGAGAAG
TTTGGAAACAAGGGCATAGAAAGACCACCCTCAAGGATTATACCGCAGGTATAAAAACTTGCATCTGGTATCAAAGAAAG
AGCGGGGACGTCACGACGTTCATTGGAAACACTGTGATCATTGCTGCATGTTTGGCCTCGATGCTTCCGATGGAGAAAAT
AATCAAAGGAGCCTTTTGCGGTGACGATAGTCTGCTGTACTTTCCAAAGGGTTGTGAGTTTCCGGATGTGCAACACTCCG
CGAATCTTATGTGGAATTTTGAAGCAAAACTGTTTAAAAAACAGTATGGATACTTTTGCGGAAGATATGTAATACATCAC
GACAGAGGATGCATTGTGTATTACGATCCCCTAAAGTTGATCTCGAAACTTGGTGCTAAACACATCAAGGATTGGGAACA
CTTGGAGGAGTTCAGAAGGTCTCTTTGTGATGTTGCTGTTTCGTTGAACAATTGTGCGTATTACACACAGTTGGACGACG
CTGTATGGGAGGTTCATAAGACCGCCCCTCCAGGTTCGTTTGTTTATAAAAGTCTGGTGAAGTATTTGTCTGATAAAGTT
CTTTTTAGAAGTTTGTTTATAGATGGCTCTAGTTGTTAAAGGAAAAGTGAATATCAATGAGTTTATCGACCTGACAAAAA
TGGAGAAGATCTTACCGTCGATGTTTACCCCTGTAAAGAGTGTTATGTGTTCCAAAGTTGATAAAATAATGGTTCATGAG
AATGAGTCATTGTCAGAGGTGAACCTTCTTAAAGGAGTTAAGCTTATTGATAGTGGATACGTCTGTTTAGCCGGTTTGGT
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TATGCAGGTGCTGAACACCATGGTGAACAAACACTTCTTGTCCCTTTCGGTCCTCATCGTCCTCCTTGGCCTCTCCTCCA
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TGCTGACTGGGGAGTAGATCTGCTAAAATTTGATGGTTGTTACTGTGACAGTTTGGAAAATTTGGCAGATGGTTATAAGC
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AGCACTTTTAAAGTTCTGCTATGTGGCGCGGTATTATCCCGTGTTGACGCCGGGCAAGAGCAACTCGGTCGCCGCATACA
CTATTCTCAGAATGACTTGGTTGAGTACTCACCAGTCACAGAAAAGCATCTTACGGATGGCATGACAGTAAGAGAATTAT

FIG. 12-3

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GCAGTGCTGCCATAACCATGAGTGATAACACTGCGGCCAACTTACTTCTGACAACGATCGGAGGACCGAAGGAGCTAACC
GCTTTTTTGCACAACATGGGGGATCATGTAACTCGCCTTGATCGTTGGGAACCGGAGCTGAATGAAGCCATACCAAACGA
CGAGCGTGACACCACGATGCCTGCAGCAATGGCAACAACGTTGCGCAAACTATTAACTGGCGAACTACTTACTCTAGCTT
CCCGGCAACAATTAATAGACTGGATGGAGGCGGATAAAGTTGCAGGACCACTTCTGCGCTCGGCCCTTCCGGCTGGCTGG
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CCGTATCGTAGTTATCTACACGACGGGGAGTCAGGCAACTATGGATGAACGAAATAGACAGATCGCTGAGATAGGTGCCT
CACTGATTAAGCATTGGTAACTGTCAGACCAAGTTTACTCATATATACTTTAGATTGATTTAAAACTTCATTTTTAATTT
AAAAGGATCTAGGTGAAGATCCTTTTTGATAATCTCATGACCAAAATCCCTTAACGTGAGTTTTCGTTCCACTGAGCGTC
AGACCCCGTAGAAAAGATCAAAGGATCTTCTTGAGATCCTTTTTTTCTGCGCGTAATCTGCTGCTTGCAAACAAAAAAAC
CACCGCTACCAGCGGTGGTTTGTTTGCCGGATCAAGAGCTACCAACTCTTTTTCCGAAGGTAACTGGCTTCAGCAGAGCG
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CGCTCTGCTAATCCTGTTACCAGTGGCTGCTGCCAGTGGCGATAAGTCGTGTCTTACCGGGTTGGACTCAAGACGATAGT
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CAGGGTCGGAACAGGAGAGCGCACGAGGGAGCTTCCAGGGGGAAACGCCTGGTATCTTTATAGTCCTGTCGGGTTTCGCC
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AGCGCCTGATGCGGTATTTTCTCCTTACGCATCTGTGCGGTATTTCACACCGCATATGGTGCACTCTCAGTACAATCTGC
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ATTCACAGATGTCTGCCTGTTCATCCGCGTCCAGCTCGTTGAGTTTCTCCAGAAGCGTTAATGTCTGGCTTCTGATAAAG
CGGGCCATGTTAAGGGCGGTTTTTTCCTGTTTGGTCACTTGATGCCTCCGTGTAAGGGGGAATTTCTGTTCATGGGGGTA
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GGGGAGGCAGACAAGGTATAGGGCGGCGCCTACAATCCATGCCAACCCGTTCCATGTGCTCGCCGAGGCGGCATAAATCG
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AGGCCGATCATCGTCGCGCTCCAGCGAAAGCGGTCCTCGCCGAAAATGACCCAGAGCGCTGCCGGCACCGTGTCCTACGAG
TTGCATGATAAAGAAGACAGTCATAAGTGCGGCGACGATAGTCATGCCCCGCGCCCACCGGAAGGAGCTGACTGGGTTGA
AGGCTCTCAAGGGCATCGGTCGAGATTTAGGTGACACTATA
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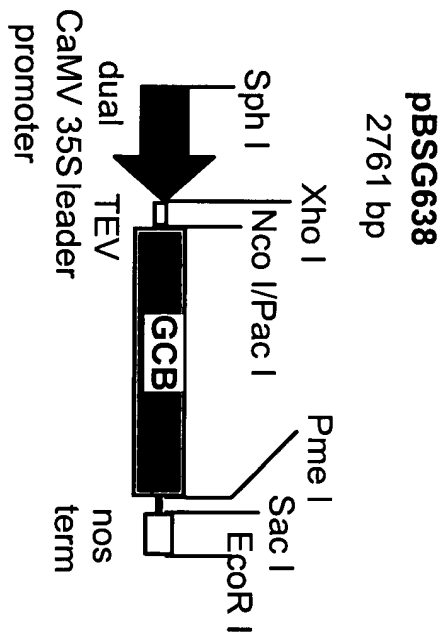
FIG. 13-1

```
GTATTTTTACAACAATTACCAACAACAACAAACAACAGACAACATTACAATTACTATTTACAATTACAATGGCATACACA
CAGACAGCTACCACATCAGCTTTGCTGGACACTGTCCGAGGAAACAACTCCTTGGTCAATGATCTAGCAAAGCGTCGTCT
TTACGACACAGCGGTTGAAGAGTTTAACGCTCGTGACCGCAGGCCCAAGGTGAACTTTTCAAAAGTAATAAGCGAGGAGC
AGACGCTTATTGCTACCCGGGCGTATCCAGAATTCCAAATTACATTTTATAACACGCAAAATGCCGTGCATTCGCTTGCA
GGTGGATTGCGATCTTTAGAACTGGAATATCTGATGATGCAAATTCCCTACGGATCATTGACTTATGACATAGGCGGGAA
TTTTGCATCGCATCTGTTCAAGGGACGAGCATATGTACACTGCTGCATGCCCAACCTGGACGTTCGAGACATCATGCGGC
ACGAAGGCCAGAAAGACAGTATTGAACTATACCTTTCTAGGCTAGAGAGAGGGGGGAAAACAGTCCCCAACTTCCAAAAG
GAAGCATTTGACAGATACGCAGAAATTCCTGAAGACGCTGTCTGTCACAATACTTTCCAGACATGCGAACATCAGCCGAT
GCAGCAATCAGGCAGAGTGTATGCCATTGCGCTACACAGCATATATGACATACCAGCCGATGAGTTCGGGGCGGCACTCT
TGAGGAAAAATGTCCATACGTGCTATGCCGCTTTCCACTTCTCCGAGAACCTGCTTCTTGAAGATTCATGCGTCAATTTG
GACGAAATCAACGCGTGTTTTTCGCGCGATGGAGACAAGTTGACCTTTTCTTTTGCATCAGAGAGTACTCTTAATTACTG
TCATAGTTATTCTAATATTCTTAAGTATGTGTGCAAAACTTACTTCCCGGCCTCTAATAGAGAGGTTTACATGAAGGAGT
TTTTAGTCACCAGAGTTAATACCTGGTTTTGTAAGTTTTCTAGAATAGATACTTTTCTTTTGTACAAAGGTGTGGCCCAT
AAAAGTGTAGATAGTGAGCAGTTTTATACTGCAATGGAAGACGCATGGCATTACAAAAAGACTCTTGCAATGTGCAACAG
CGAGAGAATCCTCCTTGGGGATTCATCATCAGTCAATTACTGGTTTCCCAAAATGAGGGATATGGTCATCGTACCATTAT
TCGACATTTCTTTGGAGACTAGTAAGAGGACGCGCAAGGAAGTCTTAGTGTCCAAGGATTTCGTGTTCACAGTGCTTAAC
CACATTCGAACATACCAGGCGAAAGCTCTTACATACGCAAATGTTTTGTCCTTCGTCGAATCGATTCGATCGAGGGTAAT
CATTAACGGTGTGACAGCGAGGTCCGAATGGGATGTGGACAAATCTTTGTTACAATCCTTGTCCATGACGTTTTACCTGC
ATACTAAGCTTGCCGTTCTAAAGGATGACTTACTGATTAGCAAGTTTAGTCTCGGTTCGAAAACGGTGTGCCAGCATGTG
TGGGATGAGATTTCGCTGGCGTTTGGGAACGCATTTCCCTCCGTGAAAGAGAGGCTCTTGAACAGGAAACTTATCAGAGT
GGCAGGCGACGCATTAGAGATCAGGGTGCCTGATCTATATGTGACCTTCCACGACAGATTAGTGACTGAGTACAAGGCCT
CTGTGGACATGCCTGCGCTTGACATTAGGAAGAAGATGGAAGAAACGGAAGTGATGTACAATGCACTTTCAGAATTATCG
GTGTTAAGGGAGTCTGACAAATTCGATGTTGATGTTTTTCCCAGATGTGCCAATCTTTGGAAGTTGACCCAATGACGGC
AGCGAAGGTTATAGTCGCGGTCATGAGCAATGAGAGCGGTCTGACTCTCACATTTGAACGACCTACTGAGGCGAATGTTG
CGCTAGCTTTACAGGATCAAGAGAAGGCTTCAGAAGGTGCATTGGTAGTTACCTCAAGAGAAGTTGAAGAACCGTCCATG
AAGGGTTCGATGGCCAGAGGAGAGTTACAATTAGCTGGTCTTGCTGGAGATCATCCGGAATCGTCCTATTCTAAGAACGA
GGAGATAGAGTCTTTAGAGCAGTTTCATATGGCGACGGCAGATTCGTTAATTCGTAAGCAGATGAGCTCGATTGTGTACA
CGGGTCCGATTAAAGTTCAGCAAATGAAAAACTTTATCGATAGCCTGGTAGCATCACTATCTGCTGCGGTGTCGAATCTC
GTCAAGATCCTCAAAGATACAGCTGCTATTGACCTTGAAACCCGTCAAAAGTTTGGAGTCTTGGATGTTGCATCTAGGAA
GTGGTTAATCAAACCAACGGCCAAGAGTCATGCATGGGGTGTTGTTGAAACCCACGCGAGGGAGTATCATGTGGCGCTTT
TGGAATATGATGAGCAGGGTGTGGTGACATGCGATGATTGGAGAAGAGTAGCTGTTAGCTCTGAGTCTGTTGTTTATTCC
GACATGGCGAAACTCAGAACTCTGCGCAGACTGCTTCGAAACGGAGAACCGCATGTCAGTAGCGCAAAGGTTGTTCTTGT
GGACGGAGTTCCGGGCTGTGGAAAAACCAAAGAAATTCTTTCCAGGGTTAATTTTGATGAAGATCTAATTTTTAGTACCTG
GGAAGCAAGCCGCGGAAATGATCAGAAGACGTGCGAATTCCTCAGGGATTATTGTGGCCACGAAGGACAACGTTAAAACC
GTTGATTCTTTCATGATGAATTTTGGGAAAAGCACACGCTGTCAGTTCAAGAGGTTATTCATTGATGAAGGGTTGATGTT
GCATACTGGTTGTGTTAATTTTCTTGTGGCGATGTCATTGTGCGAAATTGCATATGTTTACGGAGACACACAGCAGATTC
CATACATCAATAGAGTTTCAGGATTCCCGTACCCCGCCCATTTTGCCAAATTGGAAGTTGACGAGGTGGAGACACGCAGA
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TAAAAAGTCTGTTTCGCAGGAGATGGTCGGCGGAGCCGCCGGTGATCAATCCGATCTCAAAACCCTTGCATGGCAAGATCC
TGACTTTTACCCAATCGGATAAAGAAGCTCTGCTTTCAAGAGGGTATTCAGATGTTCACACTGTGCATGAAGTGCAAGGC
GAGACATACTCTGATGTTTCACTAGTTAGGTTAACCCCTACACCGGTCTCCATCATTGCAGGAGACAGCCCACATGTTTT
GGTCGCATTGTCAAGGCACACCTGTTCGCTCAAGTACTACACTGTTGTTATGGATCCTTTAGTTAGTATCATTAGAGATC
TAGAGAAACTTAGCTCGTACTTGTTAGATATGTATAAGGTCGATGCAGGAACACAATAGCAATTACAGATTGACTCGGTG
TTCAAAGGTTCCAATCTTTTTGTTGCAGCGCCAAAGACTGGTGATATTTCTGATATGCAGTTTTACTATGATAAGTGTCT
CCCAGGCAACAGCACCATGATGAATAATTTTGATGCTGTTACCATGAGGTTGACTGACATTTCATTGAATGTCAAAGATT
GCATATTGGATATGTCTAAGTCTGTTGCTGCACCTAAGGATCAAATCAAACCACTAATACCTATGGTACGAACGGCGGCA
GAAATGCCACGCCAGACTGGACTATTGGAAAATTTAGTGGCGATGATTAAAAGAAACTTTAACGCACCCGAGTTGTCTGG
CATCATTGATATTGAAAATACTGCATCTTTGGTTGTAGATAAGTTTTTTGATAGTTATTTGCTTAAAGAAAAAAGAAAAC
CAAATAAAAATGTTTCTTTGTTCAGTAGAGAGTCTCTCAATAGATGGTTAGAAAAGCAGGAACAGGTAACAATAGGCCAG
CTCGCAGATTTTGATTTTGTGGATTTGCCAGCAGTTGATCAGTACAGACACATGATTAAAGCACAACCCAAACAAAAGTT
GGACACTTCAATCCAAACGGAGTACCCGGCTTTGCAGACGATTGTGTACCATTCAAAAAAGATCAATGCAATATTCGGCC
CGTTGTTTAGTGAGCTTACTAGGCAATTACTGGACAGTGTTGATTCGAGCAGATTTTTGTTTTTCACAAGAAAGACACCA
GCGCAGATTGAGGATTTCTTCGGAGATCTCGACAGTCATGTGCCGATGGATGTCTTGGAGCTGGATATATCAAAATACGA
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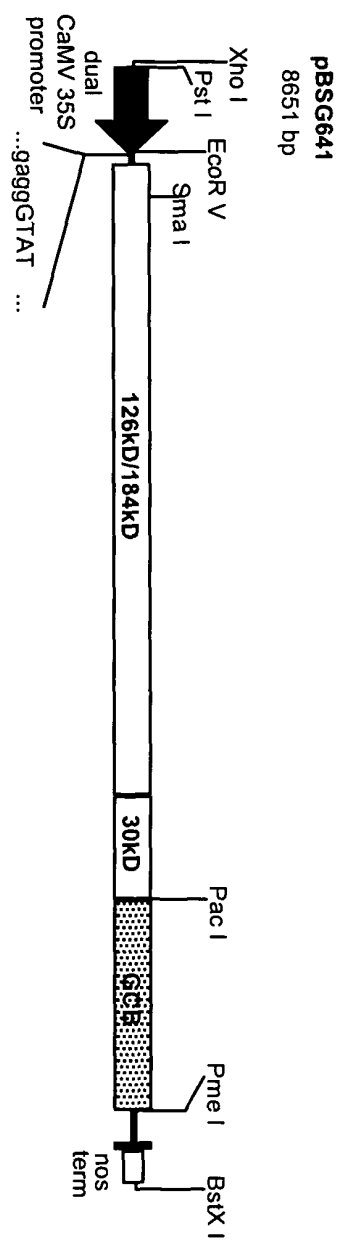
FIG. 13-2

CAAATCTCAGAATGAATTCCACTGTGCAGTAGAATACGAGATCTGGCGAAGATTGGGTTTCGAAGACTTCTTGGGAGAAG
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AGCGGGGACGTCACGACGTTCATTGGAAACACTGTGATCATTGCTGCATGTTTGGCCTCGATGCTTCCGATGGAGAAAAT
AATCAAAGGAGCCTTTTGCGGTGACGATAGTCTGCTGTACTTTCCAAAGGGTTGTGAGTTTCCGGATGTGCAACACTCCG
CGAATCTTATGTGGAATTTTGAAGCAAAACTGTTTAAAAAACAGTATGGATACTTTTGCGGAAGATATGTAATACATCAC
GACAGAGGATGCATTGTGTATTACGATCCCCTAAAGTTGATCTCGAAACTTGGTGCTAAACACATCAAGGATTGGGAACA
CTTGGAGGAGTTCAGAAGGTCTCTTTGTGATGTTGCTGTTTCGTTGAACAATTGTGCGTATTACACACAGTTGGACGACG
CTGTATGGGAGGTTCATAAGACCGCCCCTCCAGGTTCGTTTGTTTATAAAAGTCTGGTGAAGTATTTGTCTGATAAAGTT
CTTTTTAGAAGTTTGTTTATAGATGGCTCTAGTTGTTAAAGGAAAAGTGAATATCAATGAGTTTATCGACCTGACAAAAA
TGGAGAAGATCTTACCGTCGATGTTTACCCCTGTAAAGAGTGTTATGTGTTCCAAAGTTGATAAAATAATGGTTCATGAG
AATGAGTCATTGTCAGGGGTGAACCTTCTTAAAGGAGTTAAGCTTATTGATAGTGGATACGTCTGTTTAGCCGGTTTGGT
CGTCACGGGCGAGTGGAACTTGCCTGACAATTGCAGAGGAGGTGTGAGCGTGTGTCTGGTGGACAAAAGGATGGAAAGAG
CCGACGAGGCCATTCTCGGATCTTACTACACAGCAGCTGCAAAGAAAAGATTTCAGTTCAAGGTCGTTCCCAATTATGCT
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GAACAAGAACTATAGAAATGTTAAGGATTTTGGAGGAATGAGTTTTAAAAAGAATAATTTAATCGATGATGATTCGGAGG
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caaccttgactgccaggaagagccagattcctgcatcagtgagaagctcttcatggagatggcagagctcatggtctcag
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ggacttcaaggttaagaagtcacataaatcccacaggcactgtttttgcttcagctatctgaaaaggacgaattatgacct
aggGGGTAGTCAAGATGCATAATAAATAACGGATTGTGTCCGTAATCACACGTGGTGCGTACGATAACGCATAGTGTTTT
TCCCTCCACTTAAATCGAAGGGTTGTGTCTTGGATCGCGCGGGTCAAATGTATATGGTTCATATACATCCGCAGGCACGT
AATAAAGCGAGGGGTTCGGGTCGAGGTCGGCTGTGAAACTCGAAAAGGTTCCGGAAAACAAAAAAGAGAGTGGTAGGTAA
TAGTGTTAATAATAAGAAAATAAATAATAGTGGTAAGAAAGGTTTGAAAGTTGAGGAAATTGAGGATAATGTAAGTGATG
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AGGACAACAGTCCAACAGCAATTTGCGGATGCCTGGAAACCTGTGCCTAGTATGACAGTGAGATTTCCTGCATCGGATTT
CTATGTGTATAGATATAATTCGACGCTTGATCCGTTGATCACGGCGTTATTAAATAGCTTCGATACTAGAAATAGAATAA
TAGAGGTTGATAATCAACCCGCACCGAATACTACTGAAATCGTTAACGCGACTCAGAGGGTAGACGATGCGACTGTAGCT
ATAAGGGCTTCAATCAATAATTTGGCTAATGAACtGGTTCGTGGAACTGGCaTGTTCAATCAAGCAAGCTTTGAGACTGC
TAGTGGACTTGTCTGGACCACAACTCCGGCTACTTAGctattgttgtgagatttcctaaaataaagtcactgaagactta
aaattcagggtggctgataccaaaatcagcagtggttgttcgtccacttaaatataacgattgtcatatctggatccaac
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ctgataccaaaatcagcagtggttgttcgtccacttaaaaataacgattgtcatatctggatccaacagttaaaccatgt
gatggtgtatactgtggtatggcgtaaaacaacggagaggttcgaatcctcccctaaccgcgggtagcggccca

TRANSGENIC VECTOR FOR rGCB EXPRESSION

pBSG638
2761 bp

Sph I — Xho I — Nco I/Pac I — GCB — Pme I / Sac I — EcoR I

dual CaMV 35S promoter — TEV 35S leader — nos term

FIG. 14

VIRAL VECTOR FOR rGCB EXPRESSION

pBSG641
8651 bp

Xho I
Pst I
dual
CaMV 35S
promoter

EcoR V
Sma I

...gaggGTAT ...

126kD/184kD

30kD

GCB

Pac I

Pme I

nos
term

BstX I

FIG. 15